

LEFFEL

IMPROVED VERTICAL SAMSON TURBINES

BULLETIN 38



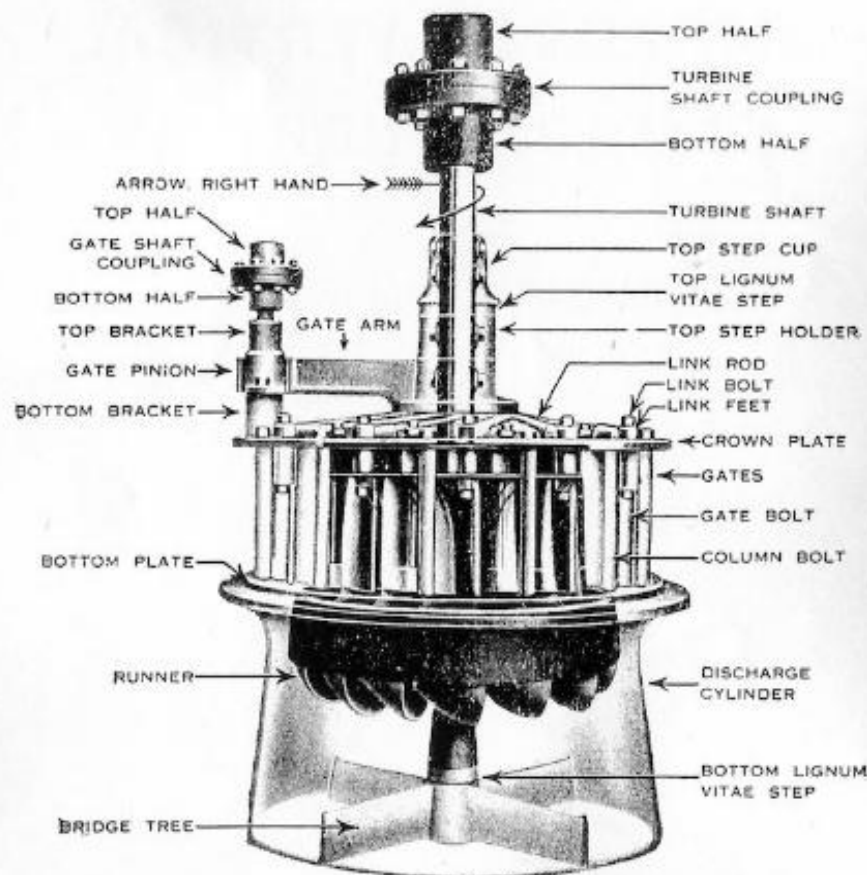
THE JAMES LEFFEL & CO.

SPRINGFIELD, OHIO, U. S. A.

ESTABLISHED 1862

Improved Vertical Samson Turbines

These turbines are built strong and substantial, and equipped with our exclusive design double steel bucket runners fitted on steel shafts. Large top and bottom lignumvitae step bearings for carrying the revolving parts of these turbines, including the weight of extra upright shafting and gearing. Also, balanced swing-type gates with separate adjustable steel connections. Each gate removable independently. All bearings of large dimensions and special material. Bolted couplings.



The above illustration shows the design and construction of our Improved Vertical SAMSON Turbines and gives the names of each of the various parts.

The arrow on Turbine Shaft shows Right Hand Rotation.

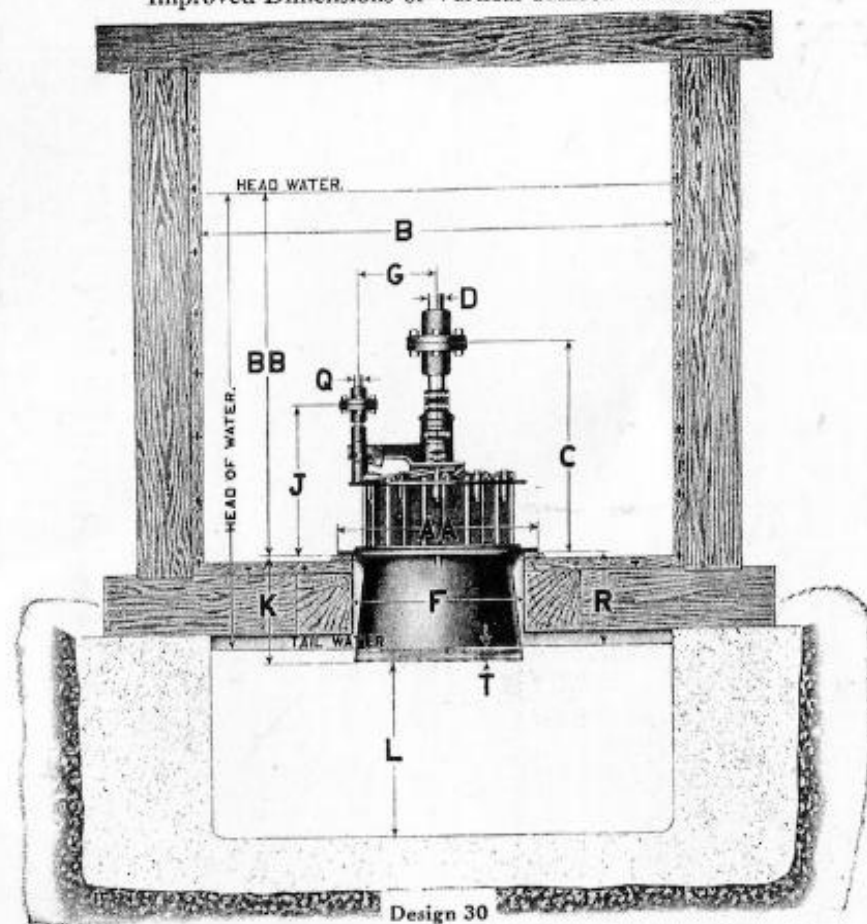
We bore and keyseat the top halves of Couplings to suit your requirements.

For dimensions of SAMSON Turbines in Open Flume Setting, see Page 3.

For dimensions of Steel Flumes for SAMSON Turbines, see Page 4.

For Power and Speed of Improved Vertical SAMSON Turbines, see Pages 5 and 6.

Improved Dimensions of Vertical Samson Turbines



SIZE OF SAMSON TURBINES	17E	17D	17C	17B	17A	20	23	26	30	35	40	45	50	56	62	68	74
AA Cylinder Flange Diameter...	33	33	33	33	33	36	40	44	49	56	63	70	76	86	94	102	110
B Penstock Width not less than	48	48	48	48	48	60	72	84	96	108	120	132	144	156	168	180	192
BB Water Depth not less than ..	42	42	42	42	42	48	54	60	66	72	78	84	90	96	102	108	114
C Turbine Shaft Height.....	32	32	32	32	32	35	40	45	50	55	60	65	70	75	80	85	90
D Turbine Coupling Bore	2 1/8	2 3/8	2 3/8	2 3/8	2 3/8	2 3/8	3 1/8	3 3/8	3 3/8	4 1/8	4 3/8	5 1/8	5 3/8	6 1/8	6 3/8	7 1/8	7 3/8
F Diameter Hole in Floor.....	28	28	28	28	28	31	35	39	44	51	57	64	70	78	86	94	102
G Between Shaft Centers	12	12	12	12	12	14	16	18	20	22	25	28	31	34	38	42	46
J Gate Shaft Height	23	23	23	23	23	25	27	29	32	35	38	42	46	50	54	59	64
K Discharge Cylinder Length..	15	15	15	15	15	17	19	21	24	27	30	33	36	40	44	48	52
L Discharge Depth not less than	27	27	27	27	27	30	36	42	48	54	60	66	72	84	96	108	120
Q Gate Coupling Bore	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
T Submergence not less than ..	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6

All dimensions in the above table are given in INCHES.

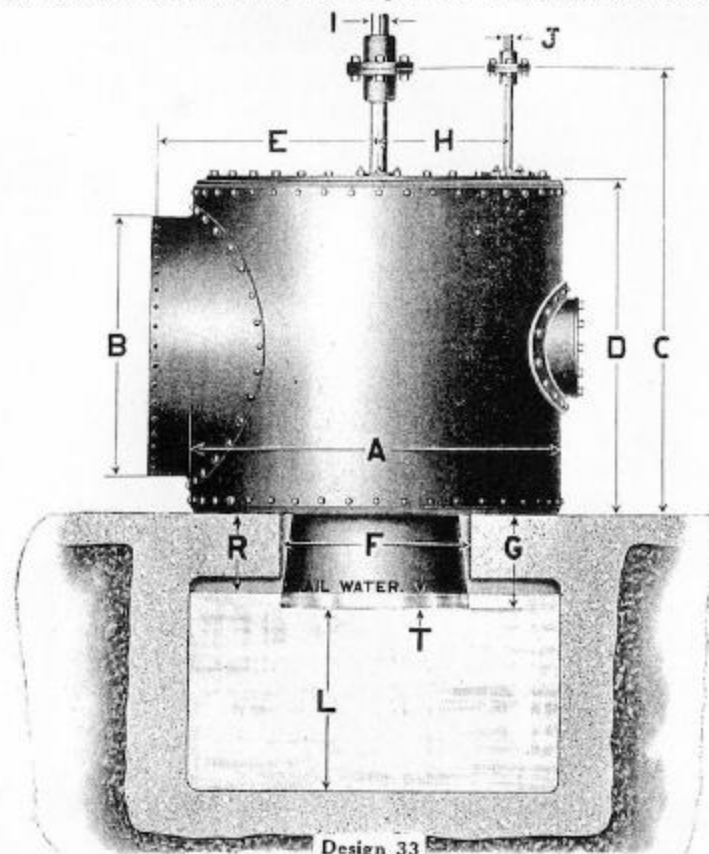
Power tables of these vertical SAMSON turbines on pages 5 and 6 inclusive.

We also build these SAMSON turbines various horizontal designs as required.

Dimensions of STEEL FLUMES for these vertical SAMSON turbines on page 4.

THE JAMES LEFFEL & CO.

Dimensions of Steel Flumes For Improved Vertical Samson Turbines



Design 33

SIZE OF SAMSON TURBINES	17E	17D	17C	17B	17A	20	23	26	30	35	40	45	50	56
A Diameter of Steel Flume.....	54	54	54	54	54	60	66	72	84	96	108	120	132	144
B Inside Diameter of Feeder Pipe.....	24	26	28	30	36	42	48	54	60	72	84	96	108	120
C Height of Turbine and Gate Shafts.....	54	56	58	60	66	72	78	84	90	102	114	132	144	156
D Height of Steel Flume.....	36	38	40	42	48	54	60	66	72	84	96	108	120	132
E Center Turbine Shaft to Center of Rivet Holes	33	33	33	33	33	36	39	42	48	54	60	66	72	78
F Size of Hole to Clear Discharge Cylinder..	28	28	28	28	28	31	35	39	44	51	57	64	70	78
G Length of Discharge Cylinder under Flume..	12	12	12	12	12	13	15	17	19	22	25	28	31	34
H Distance Between Centers of Shafts.....	12	12	12	12	12	14	16	18	20	22	25	28	31	34
I Diameter of Bore in Turbine Shaft Coupling	2 1/2	2 3/8	2 3/8	2 3/8	2 3/8	2 3/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8	4 1/8	5 1/8	5 1/8
J Diameter of Bore in Gate Shaft Coupling..	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
L Depth under Disch. Cylinder not less than.	27	27	27	27	27	30	36	42	48	54	60	66	72	84
T Submergence of Disch. Cylinder not less than	3	3	3	3	3	4	4	4	4	5	5	5	5	6

All dimensions in the above table are given in INCHES.
These STEEL FLUMES larger than 10 feet diameter made in sections,
riveted together when placing to position. Top and bottom heads cast iron.
We build all sizes vertical and horizontal steel flumes, pipes and draft tubes.

SPRINGFIELD, OHIO, U. S. A.

Power Table - Improved Vertical Samson Turbines

Size of Turbine	Head	3	4	5	6	7	8	9	10	11	12	13	14
17 E.	Power	1.1	1.7	2.5	3.2	4.1	5.0	6.0	7.0	8.1	9.2	10.4	11.7
	Water	252	291	325	356	384	411	436	460	482	503	524	544
	Speed	161	166	208	228	246	264	280	294	308	322	335	348
17 D.	Power	1.5	2.3	3.2	4.3	5.4	6.5	7.8	9.2	10.6	12.0	13.6	15.2
	Water	328	379	423	464	502	536	569	601	628	657	683	709
	Speed	161	186	208	228	246	264	280	294	308	322	335	348
17 C.	Power	2.0	3.0	4.3	5.6	7.1	8.6	10.3	12.1	14.0	15.8	17.9	19.0
	Water	433	499	558	611	650	706	748	791	828	864	900	934
	Speed	161	186	208	228	246	264	280	294	308	322	335	348
17 B.	Power	2.4	3.7	5.3	7.0	8.7	10.6	12.7	14.9	17.2	19.5	22.0	24.7
	Water	533	616	689	754	815	871	924	975	1021	1066	1110	1153
	Speed	161	186	208	228	246	264	280	294	308	322	335	348
17 A.	Power	3.2	4.9	6.9	9.1	11.4	13.9	16.6	19.5	22.5	25.5	28.8	32.3
	Water	697	805	900	986	1065	1139	1208	1275	1335	1394	1451	1506
	Speed	161	186	208	228	246	264	280	294	308	322	335	348
20.	Power	4.2	6.4	9.0	11.9	15.0	18.3	21.8	25.5	29.5	33.6	37.8	42.3
	Water	914	1055	1180	1293	1396	1493	1583	1669	1750	1828	1903	1975
	Speed	140	162	182	199	215	230	244	257	270	282	293	304
23.	Power	5.3	8.5	11.9	15.7	19.8	24.2	28.8	33.8	39.0	44.4	50.0	55.9
	Water	1209	1391	1561	1710	1847	1974	2094	2207	2315	2418	2517	2612
	Speed	127	141	156	173	187	200	211	224	235	245	255	265
26.	Power	7.10	10.9	15.2	20.1	25.3	30.9	36.8	43.2	49.8	56.7	64.0	71.5
	Water	1545	1784	1995	2185	2360	2522	2676	2821	2959	3090	3216	3338
	Speed	108	125	140	153	166	177	188	198	207	217	226	234
30.	Power	9.44	14.5	20.3	26.7	33.6	41.1	49.1	57.5	66.3	75.5	85.2	95.2
	Water	2057	2375	2650	2909	3142	3359	3563	3756	3939	4114	4282	4444
	Speed	94	108	121	132	143	153	163	171	180	188	195	203
35.	Power	12.8	19.7	27.5	36.2	45.6	55.7	66.5	77.9	89.8	102.0	115.0	129.0
	Water	2769	3220	3600	3944	4260	4554	4830	5091	5339	5577	5805	6024
	Speed	61	83	104	114	123	132	140	147	154	161	168	174
40.	Power	16.8	25.8	36.1	47.5	59.8	73.1	87.2	102.0	118.0	134.0	151.0	169.0
	Water	3657	4223	4722	5172	5587	5972	6335	6677	7003	7315	7613	7900
	Speed	70	81	91	100	108	115	122	129	135	141	147	152
45.	Power	21.2	32.7	45.7	60.1	75.7	92.5	110.0	129.0	149.0	170.0	192.0	214.0
	Water	4629	5344	5975	6546	7070	7560	8017	8450	8861	9257	9635	9999
	Speed	63	72	81	88	96	102	109	114	120	125	130	135
50.	Power	26.2	40.5	56.4	74.2	93.5	114.0	136.0	160.0	184.0	210.0	235.0	264.0
	Water	5714	6598	7377	8061	8729	9331	9897	10433	10942	11429	11895	12341
	Speed	56	65	73	80	86	92	98	103	108	113	117	122
56.	Power	32.9	50.6	70.8	93.0	117.0	143.0	171.0	200.0	231.0	263.0	297.0	332.0
	Water	7168	8227	9254	10137	10950	11705	12415	13087	13726	14336	14922	15485
	Speed	50	58	65	71	77	82	87	92	96	101	105	109
62.	Power	40.3	62.1	86.8	114.0	144.0	176.0	210.0	245.0	283.0	323.0	364.0	407.0
	Water	8767	10146	11344	12426	13419	14349	15219	16042	16825	17574	18291	18982
	Speed	45	52	59	64	69	74	79	83	87	91	95	98
68.	Power	48.5	74.7	104.0	137.0	171.0	211.0	252.0	295.0	341.0	389.0	438.0	489.0
	Water	10570	12204	13645	14947	16145	17258	18306	19297	20238	21139	22002	22832
	Speed	41	48	53	59	63	68	72	76	79	83	86	89
74.	Power	57.5	88.5	124.0	162.0	205.0	250.0	299.0	350.0	403.0	460.0	518.0	579.0
	Water	12517	14453	16159	17701	19120	20439	21679	22852	23967	25034	26056	27039
	Speed	38	44	49	54	58	62	66	70	73	76	79	82

EXPLANATION OF ABOVE TABLES

HEAD=Effective head in feet. WATER=Cubic feet discharged per minute.
POWER=Full gate horsepower. SPEED=Number of revolutions per minute.
We also build IMPROVED SAMSON turbines developing power and speed values
HALF WAY between each of the different sizes of turbines given in above table.
These IMPROVED VERTICAL SAMSON turbines to develop above power, speed
and efficiency values, must be installed and operated substantially as given on page 3.

Power Tables Continued on page 6.

THE JAMES LEFFEL & CO.

Power Table - Improved Vertical Samson Turbines

Size of Turbine	Head	15	16	17	18	19	20	21	22	23	24	25	26
17 E.	Power Water Speed	12.9 553 360	14.3 581 373	15.6 599 384	17.0 617 394	18.4 634 405	19.9 650 416	21.4 666 426	22.9 682 436	24.5 697 446	26.2 712 454	27.8 727 464	29.5 741 474
17 D.	Power Water Speed	16.9 734 360	18.6 758 373	20.4 782 384	22.1 804 394	24.0 827 405	25.9 848 416	27.9 869 426	29.9 889 436	32.0 909 446	34.1 929 454	36.2 948 464	38.5 967 474
17 C.	Power Water Speed	22.2 967 360	24.5 998 373	26.8 1029 384	29.1 1059 394	31.6 1088 405	34.1 1116 416	36.8 1144 426	39.4 1171 436	42.2 1197 446	45.0 1223 454	47.7 1248 464	50.7 1273 474
17 B.	Power Water Speed	27.4 1193 360	30.2 1232 373	33.1 1270 384	36.0 1307 394	39.0 1343 405	42.1 1377 416	45.4 1411 426	48.6 1444 436	52.0 1476 446	55.5 1509 454	58.9 1540 464	62.6 1571 474
17 A.	Power Water Speed	35.6 1559 360	39.5 1610 373	43.3 1660 384	47.0 1708 394	51.0 1755 405	55.0 1800 416	59.3 1845 426	63.5 1888 436	68.0 1930 446	72.5 1972 454	77.0 2013 464	81.8 2053 474
20.	Power Water Speed	46.9 2044 315	51.5 2111 325	56.6 2179 333	61.7 2259 345	66.9 2330 354	72.2 2390 364	77.7 2449 373	83.3 2476 381	88.0 2531 390	94.9 2596 398	101.0 2639 407	107.0 2691 415
23.	Power Water Speed	62.0 2703 274	68.3 2792 283	74.9 2878 292	81.6 2961 300	88.5 3043 308	95.5 3122 316	103.0 3199 324	110.0 3274 332	118.0 3348 339	125.0 3420 346	133.0 3489 354	141.0 3559 361
26.	Power Water Speed	79.3 3455 242	87.3 3569 250	95.7 3678 258	104.0 3785 265	113.0 3888 273	121.0 3919 280	131.0 4088 287	141.0 4181 293	151.0 4278 300	160.0 4370 306	171.0 4460 313	180.0 4549 319
30.	Power Water Speed	106.0 4600 210	116.0 4751 217	127.0 4897 224	139.0 5039 230	150.0 5177 236	162.0 5312 242	175.0 5443 248	188.0 5571 254	200.0 5696 260	214.0 5818 265	227.0 5938 271	241.0 6056 276
35.	Power Water Speed	143.0 6236 180	158.0 6440 186	173.0 6638 192	188.0 6831 197	204.0 7018 203	220.0 7200 208	237.0 7378 213	254.0 7552 218	272.0 7721 223	290.0 7887 227	308.0 8050 232	327.0 8210 237
40.	Power Water Speed	188.0 8178 157	207.0 8446 163	226.0 8706 169	247.0 8958 172	268.0 9204 177	289.0 9443 182	311.0 9676 186	333.0 9904 191	356.0 10126 195	380.0 10344 199	404.0 10558 203	428.0 10767 207
45.	Power Water Speed	238.0 10350 140	262.0 10689 145	287.0 11018 149	312.0 11337 153	336.0 11648 158	360.0 11951 162	383.0 12246 166	422.0 12534 170	451.0 12816 173	481.0 13091 177	511.0 13361 181	542.0 13626 184
50.	Power Water Speed	293.0 12777 126	324.0 13196 130	354.0 13603 134	385.0 13997 138	418.0 14380 142	451.0 14754 145	486.0 15118 149	521.0 15474 153	557.0 15822 156	593.0 16162 159	631.0 16496 162	669.0 16822 166
56.	Power Water Speed	368.0 16028 112	405.0 16554 116	444.0 17063 120	484.0 17558 123	524.0 18039 127	566.0 18508 130	609.0 18965 133	653.0 19411 136	699.0 19847 139	744.0 20274 142	791.0 20692 145	839.0 21102 148
62.	Power Water Speed	451.0 19648 102	497.0 20292 105	544.0 20917 108	593.0 21523 111	643.0 22113 114	694.0 22688 117	747.0 23248 120	801.0 23795 123	856.0 24329 126	913.0 24853 128	970.0 25365 131	1030.0 25868 134
68.	Power Water Speed	542.0 23634 93	597.0 24409 96	654.0 25160 99	713.0 25890 101	773.0 26599 104	835.0 27290 107	898.0 27964 109	963.0 28622 112	1030.0 29265 115	1098.0 29895 117	1167.0 30511 120	1238.0 31115 122
74.	Power Water Speed	642.0 27986 85	708.0 28906 88	775.0 29796 91	844.0 30659 94	916.0 31500 96	992.0 32318 99	1064.0 33116 101	1141.0 33895 103	1220.0 34657 106	1296.0 35403 108	1382.0 36132 110	1466.0 36848 112

EXPLANATION OF ABOVE TABLES

HEAD=Effective head in feet. WATER=Cubic feet discharged per minute. POWER=Full gate horsepower. SPEED=Number of revolutions per minute. We also build IMPROVED SAMSON turbines developing power and speed values HALF WAY between each of the different sizes of turbines given in above table.

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SPRINGFIELD, OHIO, U. S. A.

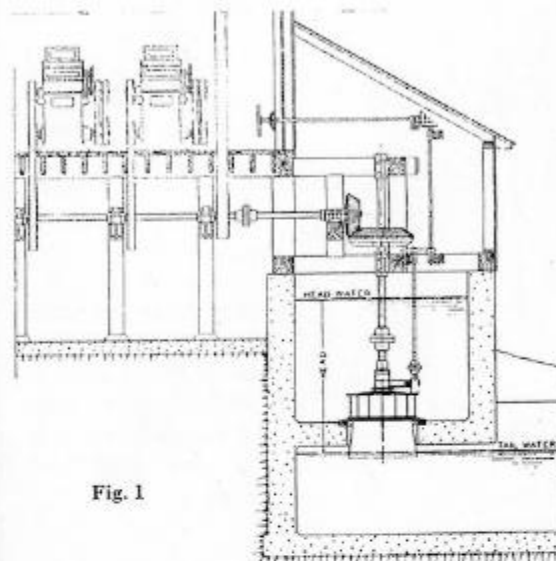


Fig. 1

Improved SAMSON Turbine Driving Flour Mill

Fig. 2 shows a typical arrangement for driving a Feed Mill with a Vertical SAMSON Turbine under a low head of water. Many variations of this drive may be used in connection with Mill and other machinery.

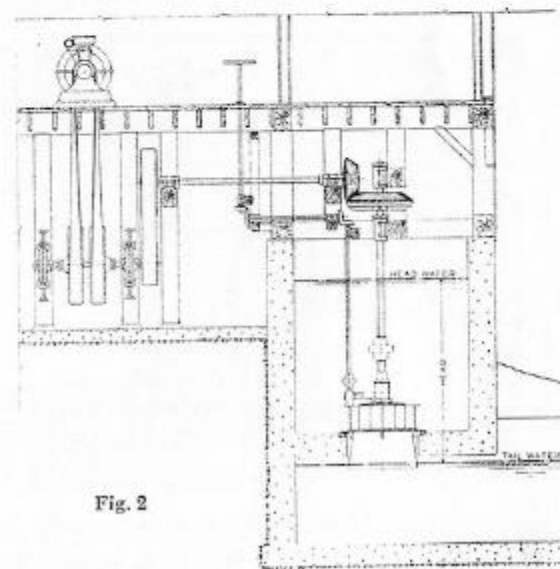


Fig. 2

Improved SAMSON Turbine Driving Feed Mill

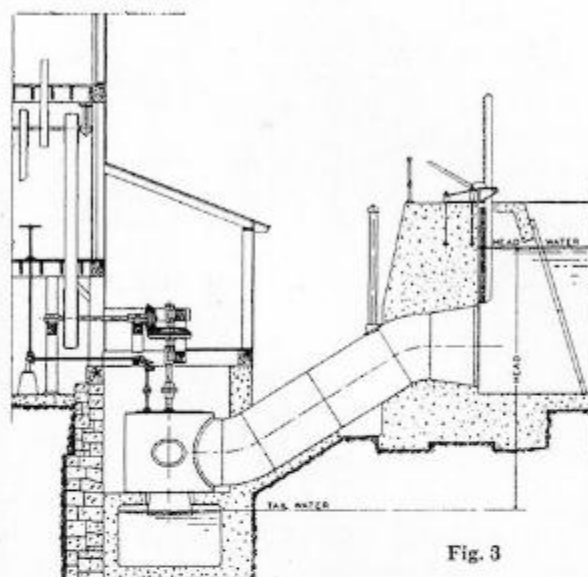


Fig. 3

Improved SAMSON Turbine in Steel Pressure Flume

Fig. 3. When higher heads of water are available, a Vertical SAMSON Turbine installed in a Steel Pressure Flume (see page 4) is often the most economical setting. When remodeling old water power mills the Turbine may be set outside of the mill building to save building costs.

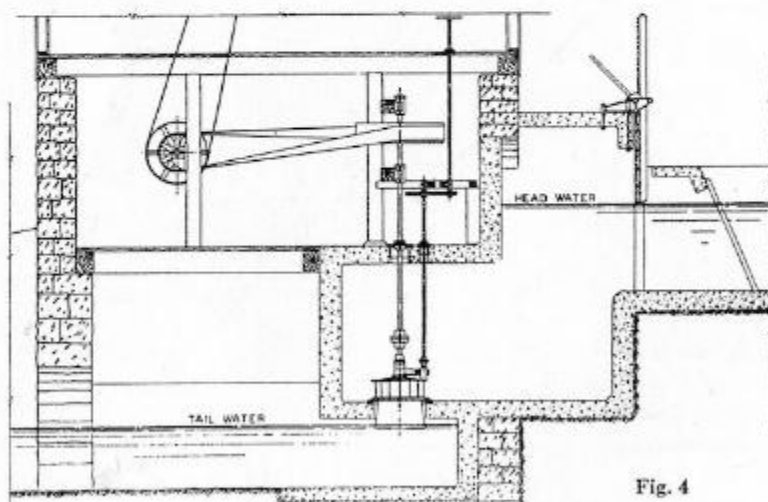


Fig. 4

Improved SAMSON Turbine in Concrete Pressure Flume

Fig. 4 illustrates a Vertical SAMSON Turbine in Concrete Pressure Flume driving line shaft through a Quarter Turn Belt. In some cases concrete construction is more convenient to use, especially where the reinforcement of old foundations and walls is desired.

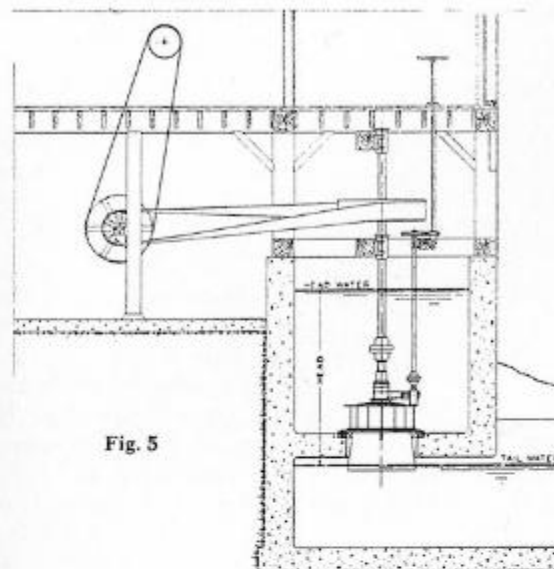


Fig. 5

Improved SAMSON Turbine with Quarter Turn Belt Drive to Mill Line Shaft

Fig. 5. The relatively high speed of the Improved SAMSON Turbine under low heads of water frequently permits the use of a Quarter Turn Belt Drive, as a minimum diameter of driving pulley is required. This type of drive is quiet and efficient.

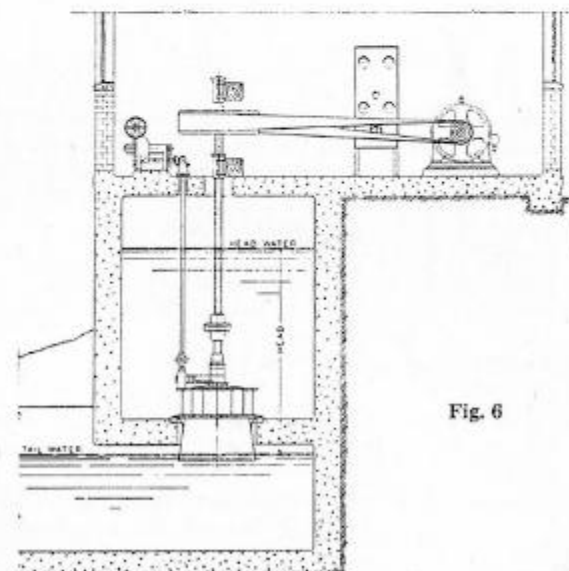


Fig. 6

Fig. 6 shows a Vertical SAMSON Turbine in Open Flume driving a high speed, horizontal Electric Generator through Quarter Turn Belt. A SAMSON Turbine may be used with or without a Governor.

Improved SAMSON Turbine with Quarter Turn Belt Drive to Electric Generator

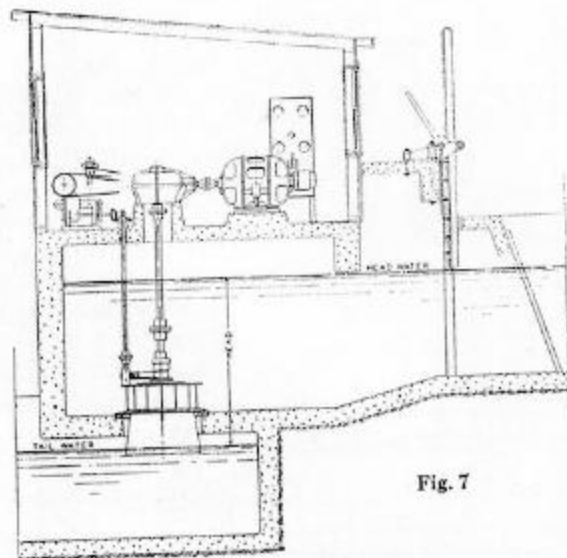


Fig. 7

Improved SAMSON Turbine in Open Flume with Speed Increaser Drive to Electric Generator

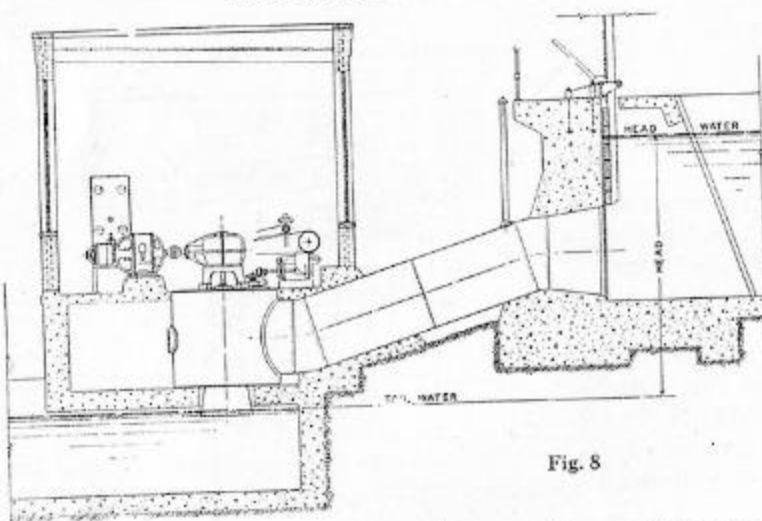


Fig. 8

Improved SAMSON Turbine in Steel Pressure Flume with Speed Increaser Drive to Electric Generator

The Speed Increaser Drive consists of accurately machined steel gears encased in a metal housing filled with oil. These gears are of the correct proportion to step up the Turbine speed to the high speed of the Generator. This makes a very quiet, compact and efficient arrangement. Further particulars will be furnished on request.

Figures 7 and 8 shown on this page illustrate a very efficient and modern method of driving a horizontal, high speed Electric Generator using a Vertical SAMSON Turbine which may be installed in either an Open Flume (Fig. 7) or a Steel Pressure Flume (Fig. 8).

Our SAMSON TURBINE, described in this Bulletin (Pages 1 to 10, inclusive), is a product of over ninety-two years of continuous experience in the design and manufacture of high grade, hydraulic equipment. Many improvements have been made in this Turbine without changing overall dimensions or operating speed, and it is today the most POWERFUL and EFFICIENT TURBINE especially adapted for driving factory and mill equipment.

In addition to the foregoing examples of SAMSON TURBINE installation many other arrangements may be used, utilizing horizontal as well as vertical settings. Our Engineering Department will gladly assist and advise you regarding any details relating to the installation of LEFFEL Turbines. In order that you may realize the most from this service please give us all possible information with your first inquiry, using the following as a guide:

HEAD OF WATER: This is the vertical distance from Head Water surface down to Tail Water surface. The term "HEAD" is graphically illustrated on Figures 1 to 8, inclusive.

QUANTITY OF WATER AVAILABLE: If possible give minimum and average stream flow in cubic feet per minute. See pages 14 and 15 for instructions for measuring the flow of streams.

MACHINERY TO BE DRIVEN: State kinds of machinery to be driven, pulley sizes and line shaft speeds.

PRESENT TURBINES: State make and size of present turbines; this is always helpful in the selection of new equipment. Send drawings, sketches or photos of present conditions.

PIPE LINE: If present Pipe Line or Feeder Pipe is to be used state length and diameter. If it is to be new, state length required.

IMPORTANT - Please Note!

We ALSO design and manufacture a complete line of Vertical and Horizontal Turbines of various capacities and speeds for driving Electric Generators, Pumps, Paper Mills, Textile Mills and many other kinds of heavy duty machinery. A few of these Designs are illustrated on Pages 12 and 13.

Our staff of designers, with a background of Company experience extending over more than three-quarters of a Century, have produced Hydraulic Turbines, tested by disinterested Engineers, that Established World's Record EFFICIENCIES in the Holyoke Testing Flume, in our Testing Laboratory, and in the field.

SEND FOR OUR LATEST BULLETINS AND INFORMATION CONCERNING HUNDREDS OF DESIGNS, TYPES AND CAPACITIES OF TURBINES MANUFACTURED BY US TO MEET YOUR SPECIFIC CONDITIONS AND REQUIREMENTS.

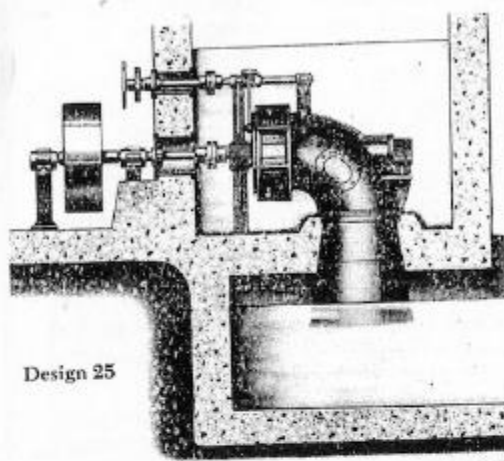
We also manufacture and are prepared to quote on:

Pipe Lines,
Penstocks,
Draft Tubes,
Manholes,

Head Gate Hoists,
Head Gates,
Trash Racks,
Drain Valves.

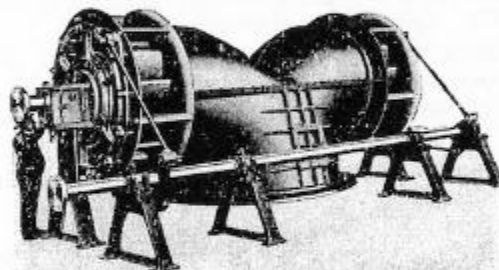
ALL OUR TURBINES ARE FULLY GUARANTEED

THE JAMES LEFFEL & CO.

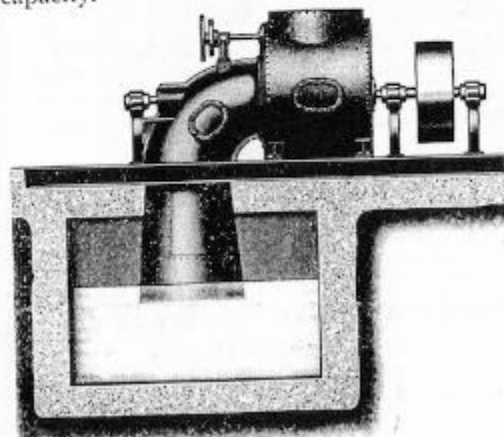


Design 25

Design 22 indicates a Double Runner, Center Discharge, Horizontal Turbine designed for heavy duty. Turbines similar to this may be installed in Open Flumes or in Horizontal Steel Plate Pressure Cases. This Twin Runner design permits high speed with great capacity. Frequently pairs of Turbines of this type are connected in tandem for still greater capacity.



Design 22

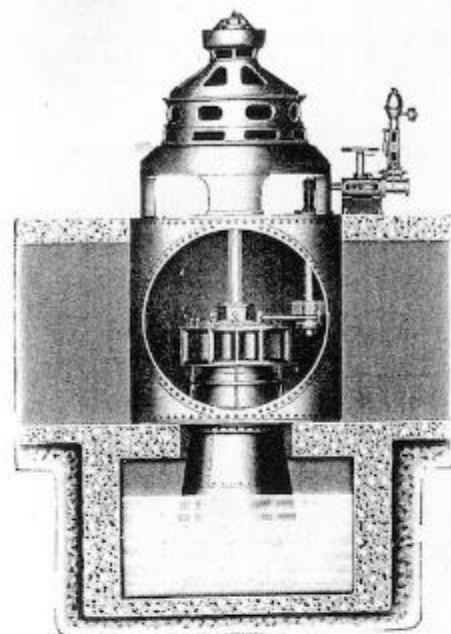


Design 24

Design 25 shows a Single Runner Horizontal Turbine in an Open Flume, arranged for belt drive. LEFFEL turbines of this Design can be furnished with coupling for direct connection, or a V Belt Drive may be used if desired. Numerous LEFFEL Designs, other than shown herein, are available to meet special requirements of head and capacity.

Design 24 illustrates a Single Discharge Horizontal Turbine similar to Design 25 except that it is installed in a Steel Plate Pressure Case suitable for higher heads of water. Many other forms of this same design are available. We also specialize in the design and manufacture of Horizontal and Vertical Scroll Case Turbines of various capacities and speeds. YOUR SPECIFICATIONS WILL RECEIVE OUR PROMPT ATTENTION.

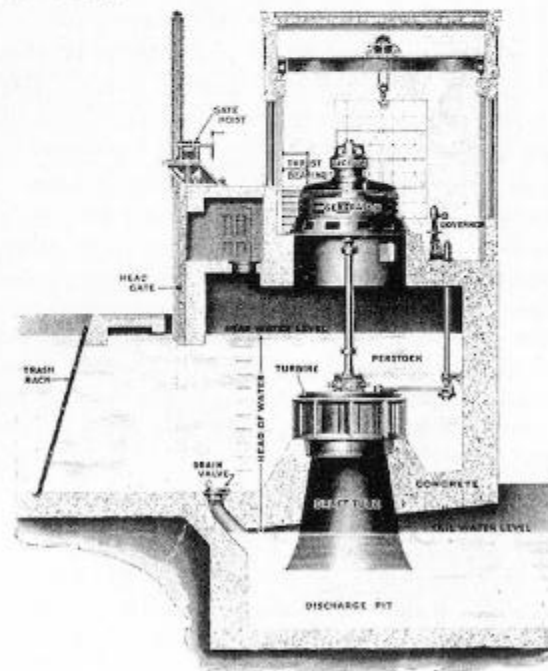
SPRINGFIELD, OHIO, U. S. A.



Design 156

Design 156 shows a Vertical LEFFEL Turbine in a Steel Pressure Flume and direct connected to a Vertical Electric Generator which is mounted on top of the Flume. This makes a complete self contained unit, very economical as to field construction and erection costs. It may be used under low heads of water where present conditions do not permit of an economical open Flume installation and it is also admirably suited to the higher head developments involving Pipe Lines. LEFFEL Turbines of all types may be used in this Design.

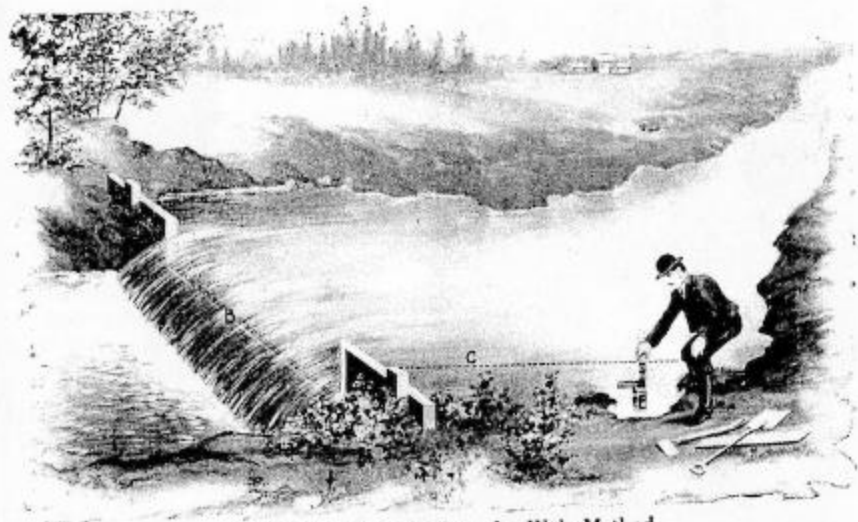
Design A159, shown at the right, illustrates a complete typical Open Flume setting for a LEFFEL Vertical Turbine direct connect to Vertical Electric Generator. This type of setting is particularly adapted to the lower Heads of Water and, when ample water passages are provided, highest Efficiency is possible. WE ALSO FURNISH MANY other designs of Vertical Turbines suitable for high or low heads of water and for installation in cast iron, steel or concrete Scroll Cases. WRITE FOR FURTHER PARTICULARS.



Design A 159

THE JAMES LEFFEL & CO.

Different Methods With Instructions For Measuring Water



Measuring Flow of Water by Weir Method

After deciding upon suitable location for the new power plant, the following preliminary measurements must be obtained:

FIRST, obtain in feet the head of water. This is the vertical distance from the surface of water above dam down to the tail water surface below dam at the place where turbines will be located.

SECOND, obtain minute cubic feet of water. Several methods may be used, the easiest and most commonly used methods are as follows:

If the stream is large, select place where water flows slowly for some distance between parallel banks and where the bottom of stream is fairly even. Then carefully space and measure the cross sectional area of water in square feet. Then place a float that sinks well down into the water in the center of stream and accurately measure the distance in feet the float travels in one minute. Then multiply this distance by the cross sectional square feet area, and eighty-three per cent of this result will be approximately the minute cubic feet of water flowing in the stream. Or,

If the stream is small the water can be measured by weir. (See the above illustration.) Select first a suitable location in stream where water flows slowly, then place a board with notch in same, forming a weir dam; the down stream edge of weir notch beveled almost to a sharp edge; the width B must be about six times the greatest depth of water flowing over weir. The bottom edge of weir not less than one foot above

Table Giving Minute Cubic Feet of Water 1 Inch Wide Flowing Over Weir

Inches Depth C Over Stake	1/8 Inch	1/4 Inch	3/8 Inch	1/2 Inch	5/8 Inch	3/4 Inch	7/8 Inch
1 Inch	.40	.47	.55	.65	.74	.83	.93
2 "	1.14	1.24	1.36	1.47	1.59	1.71	1.83
3 "	2.09	2.23	2.36	2.50	2.63	2.78	2.92
4 "	3.22	3.37	3.52	3.68	3.83	3.99	4.16
5 "	4.50	4.67	4.84	5.01	5.18	5.36	5.54
6 "	5.90	6.09	6.28	6.47	6.65	6.85	7.05
7 "	7.44	7.64	7.84	8.05	8.25	8.45	8.66
8 "	9.10	9.31	9.52	9.74	9.96	10.18	10.40
9 "	10.86	11.08	11.31	11.54	11.77	12.00	12.23
10 "	12.71	12.95	13.19	13.43	13.67	13.93	14.16
11 "	14.67	14.92	15.18	15.43	15.67	15.96	16.20
12 "	16.73	16.99	17.26	17.52	17.78	18.05	18.32
13 "	18.87	19.14	19.42	19.69	19.97	20.24	20.52
14 "	21.09	21.37	21.65	21.94	22.22	22.51	22.79
15 "	23.38	23.67	23.97	24.26	24.56	24.86	25.16
16 "	25.76	26.06	26.36	26.66	26.97	27.27	27.58
17 "	28.20	28.51	28.82	29.14	29.45	29.76	30.08
18 "	30.70	31.02	31.34	31.66	31.98	32.31	32.63
19 "	33.29	33.61	33.94	34.27	34.60	34.94	35.27
20 "	35.94	36.27	36.60	36.94	37.28	37.62	37.96
21 "	38.65	39.00	39.34	39.69	40.04	40.39	40.73
22 "	41.43	41.78	42.13	42.49	42.84	43.20	43.56
23 "	44.28	44.64	45.00	45.38	45.71	46.08	46.43
24 "	47.18	47.55	47.91	48.28	48.65	49.02	49.39

the surface of water below the down-stream side of weir. Then drive a stake up stream several feet above weir. The top of stake must be exactly level with bottom edge of weir. When all water is flowing over weir, measure the depth C over top of stake, then read above weir table which gives the minute cubic feet of water 1 inch wide flowing over weir. Example: Assume width B of weir as 70 inches, depth C as 12 1/2 inches. Look down the first column in weir table to 12 inches, then horizontally to column under 1/2 inch. The minute cubic feet flowing over weir 1 inch wide, 12 1/2 inches deep will be 17.78 multiplied by 70 inches, the result is 1244.60 minute cubic feet flowing over weir.

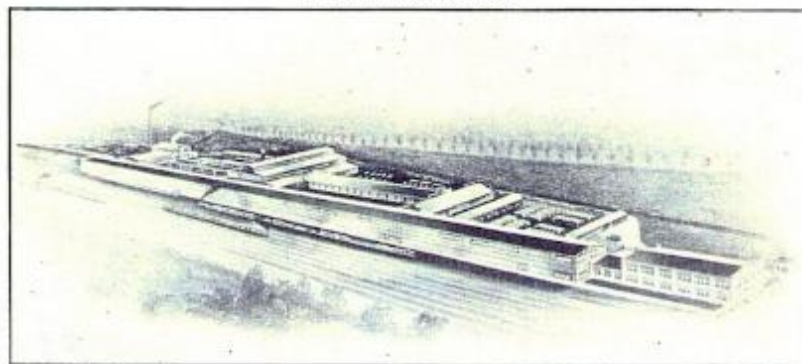
The horsepower of the minute cubic feet of water thus obtained for any head up to 50 feet given in power tables, pages 10 to 13, inclusive.

If water is measured by miner's inch method, give us the number of miner's inches of water per minute, together with the head of water. We then will advise the horsepower that can be developed by our turbines.

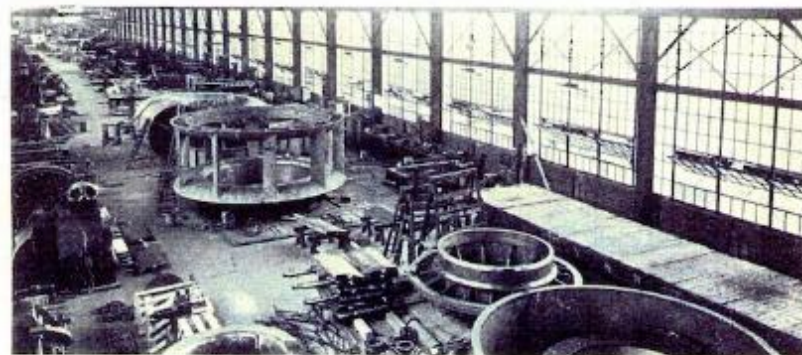
Send us full measurements and particulars regarding proposed new turbine installment. We will reply promptly with full information.

THE JAMES LEFFEL & CO.

ESTABLISHED 1862



MAIN OFFICE AND FACTORY



MACHINE AND ERECTING DEPARTMENT



SHOWING LEFFEL TURBINES IN PRODUCTION

Our factory is located on several principal railroads and is of latest industrial design thruout, equipped with special motor driven machinery for produciton of Leffel turbine water wheels and accessories. We give all orders our most prompt and careful attention.